

A review of New World *Eurytenes* s. str. (Hymenoptera, Braconidae, Opiinae)

Andrea K. Walker[†], Robert A. Wharton[‡]

Department of Entomology, Texas A&M University, College Station, TX 77843, USA

[†] [urn:lsid:zoobank.org:author:2B6DA18E-EF55-46A3-9630-377D6B5EE8FF](https://zoobank.org/urn:lsid:zoobank.org:author:2B6DA18E-EF55-46A3-9630-377D6B5EE8FF)

[‡] [urn:lsid:zoobank.org:author:6AAF121C-A6DB-47B0-81EE-131259F28972](https://zoobank.org/urn:lsid:zoobank.org:author:6AAF121C-A6DB-47B0-81EE-131259F28972)

Corresponding author: Robert A. Wharton (rawbaw2@tamu.edu)

Academic editor: Stefan Schmidt | Received 25 August 2010 | Accepted 14 December 2010 | Published 8 February 2011

[urn:lsid:zoobank.org:pub:C9D78A50-B94B-4C11-8ECE-D57CBCE82442](https://zoobank.org/pub:C9D78A50-B94B-4C11-8ECE-D57CBCE82442)

Citation: Walker AK, Wharton RA (2011) A review of New World *Eurytenes* s. str. (Hymenoptera, Braconidae, Opiinae). Journal of Hymenoptera Research 20: 23–46. doi: 10.3897/jhr.29.877

Abstract

The New World species of *Eurytenes* Foerster sensu stricto (Hymenoptera: Braconidae, Opiinae) are revised, and a key to these species is presented. Four new species are described: *Eurytenes* (*Eurytenes*) *dichromus* **sp. n.** from Texas, *E. (E.) microsomus* **sp. n.** from Texas, *E. (E.) pachycephalus* **sp. n.** from Mexico, and *E. (E.) ormenus* **sp. n.** from Mexico. *Eurytenes abnormis* (Wesmael) is redescribed for comparison, and its host records are reviewed.

Keywords

Parasitoid, endoparasite, Agromyzidae, pterostigma

Introduction

Eurytenes was originally described by Foerster (1862) to accommodate *Opius abnormis* Wesmael, 1835, a species with distinctive wing venation. Despite numerous changes in opiine classification since Foerster (1862), including treatment of most of his proposed generic names as synonyms (e. g. Szépligeti 1904, Gahan 1915, Fischer 1972), *Eurytenes* has almost universally been treated as a valid genus (see Quicke et al. 1997 for

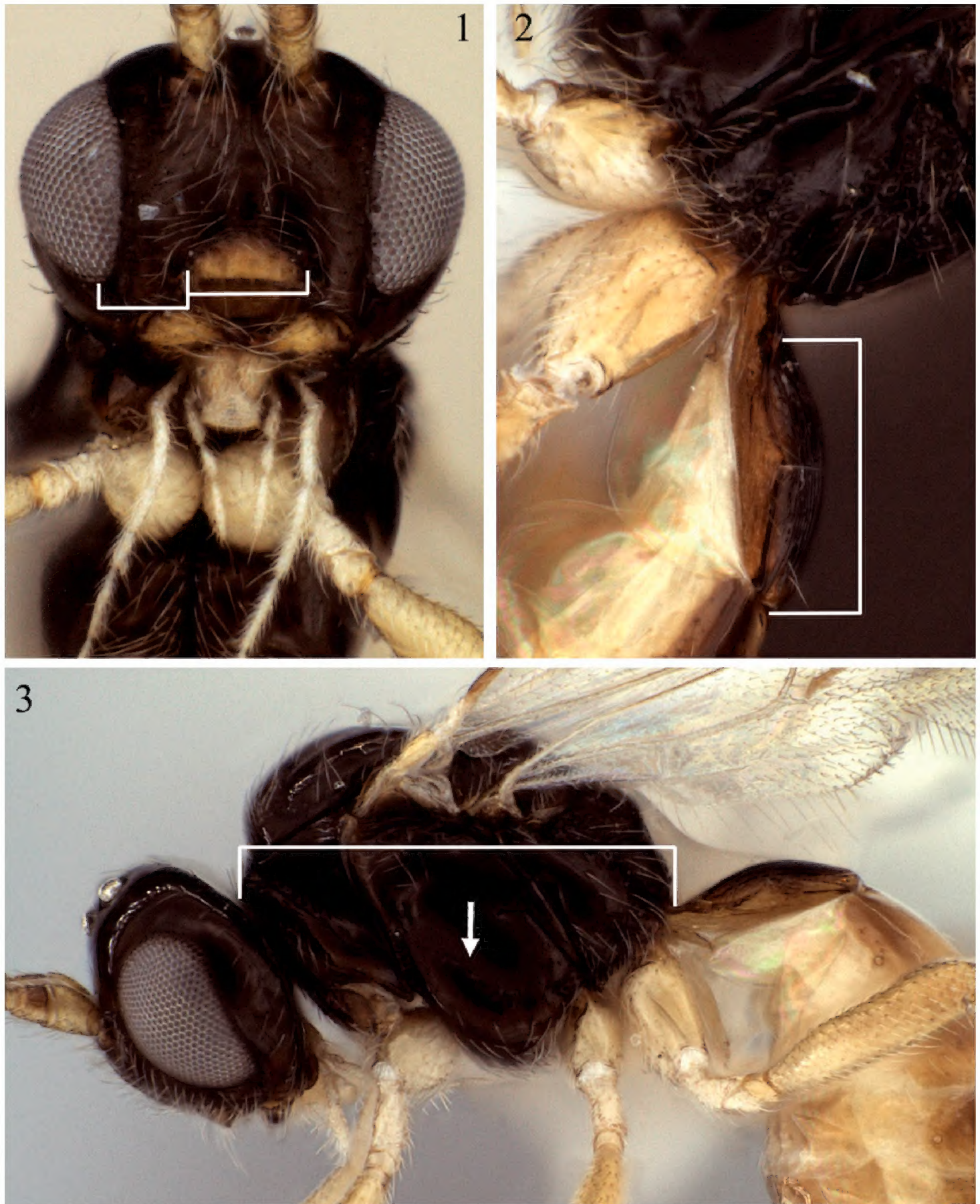
an exception). Wharton (1988) broadened the concept of *Eurytenes* by including *Opius macrocerus* Thomson, 1895, and Fischer (1998) expanded the concept further, proposing six subgenera (*Eurytenes* s. str., *Jucundopius* Fischer, 1984; *Stigmatopoea* Fischer, 1986; *Xynobiotenes* Fischer, 1998; *Oetzalotenes* Fischer, 1998; *Opiotenes* Fischer, 1998). Fischer (1998) included 16 species, and five others have been added since (Chen and Weng 2005; Wu and Chen 2006). Van Achterberg (2004) recognized *Xynobius* Foerster, 1862 as a valid genus and transferred *Stigmatopoea* to it but did not discuss *Eurytenes*. Wharton (2006) placed *Xynobius* as a subgenus of *Eurytenes*. *Eurytenes* s. str. is defined by the attachment of the radial cross-vein (r) to the extreme base of the stigma. In the remaining subgenera of *Eurytenes* s. l. (*Xynobius*, *Jucundopius*, *Stigmatopoea*, *Xynobiotenes*, *Oetzalotenes*, and *Opiotenes*), r arises more distally along the stigma.

In addition to the type species, three other species are currently included in *Eurytenes* s. str.: *E. orientalis* Fischer, 1966, *E. cratospilum* Chen & Weng, 2005, and *E. basinervis* Wu & Chen, 2006. *Eurytenes abnormis* is Holarctic (Fischer 1972, 1977), *E. orientalis* is from the Philippines (Fischer 1966), and the other two species are from China (Chen and Weng 2005; Wu and Chen 2006). The purpose of this paper is to expand the known distribution of *Eurytenes* s. str. by describing new species from central Texas and central Mexico. We also discuss morphological features useful for discriminating both New and Old World species.

Materials and methods

Nearly all of the material used in this revision is from the Texas A&M University Insect Collection (TAMU). Material for comparison was obtained from or examined at the following institutions: American Entomological Institute (AEI), Gainesville, FL, USA; Canadian National Collection, Ottawa, Canada; Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium; Naturhistorisches Museum, Vienna, Austria (NHMW); U. S. National Museum of Natural History, Washington, D. C. (USNM). The newly described species were compared with several Old World specimens, including *E. abnormis* from eight European localities, the holotype of *E. orientalis*, two undetermined specimens from Taiwan, and one undetermined specimen from the Kurile Islands.

Descriptive terminology largely follows Sharkey and Wharton (1997), with modifications as in Wharton (2006). For clarity, the first metasomal tergite (T1) is referred to as the petiole with the following median tergites referred to as T2, T3, etc. The mesoscutum consists of an anterior declivity and the more readily visible, relatively flat portion posteriorly referred to in the descriptions as the mesoscutal disc. Measurements were taken using a reticle on a Zeiss Stemi, DRC microscope and converted to ratios or millimeters. Flagellomere width was measured at the narrowest point. Clypeus was measured as in Fig. 1 and the width compared to the distance from the inner margins of anterior tentorial pits to the eye. Face width was measured as the shortest distance between eyes and compared to face height from epistomal sulcus at top of clypeus to the lower margin of the antennal socket. Angle of precoxal sulcus was estimated with



Figures 1–3. 1 *E. microsomus* sp. n., face, bars = clypeal measurements 2 *E. dichromus* sp. n., petiole, lateral view, bar = length measurement 3 *Eurytenes microsomus*, lateral view, arrow = precoxal sulcus, bar = mesosomal length.

head-mesosoma and mesosoma-petiole attachments aligned horizontally. Hind tibia was measured from attachment point of femur to attachment point of tarsus vs maximum width at apex. Petiole (=T1) length was measured laterally from the base of the dorsope to attachment point of T2 (Fig. 2). Total ovipositor length, measured in lateral

view, was estimated using specimens whose hypopygium was extended, thus exposing the majority of the ovipositor. Mesosomal length was measured as in Fig. 3. Measurements are presented as ranges followed by the mean (m). The term butterscotch is used to describe the tawny, yellowish-brown color of many of the body parts.

In the material examined sections, label data are presented in a uniform format for specimens other than the holotypes of new species. For holotypes of newly described species, data are recorded exactly as given on specimen labels, with square brackets for additional data not on the labels.

Images were acquired digitally using Syncroscopy's Auto-Montage Pro 5.01.0005 (Copyright Synoptics Ltd.) and PictureFrame (TM) Application 2.3 in combination with a ProgRes 3008 digital camera mounted on a Leica MZ APO dissecting microscope. All images were further processed using Adobe Photoshop® CS5. Images are stored in mx, a web-based content management system that facilitates data management and dissemination for taxonomic and phylogenetic works (e. g. Yoder et al. 2006). The mx project is open source, with code and further documentation available at <http://sourceforge.net/projects/mx-database/>.

Taxonomy

Genus *Eurytenes* Foerster s. str.

Eurytenes Foerster 1862: 259. Type species *Opius abnormis* Wesmael 1835 by original designation and monotypy.

Description. *Head.* Antenna filiform, longer than body. Frons, vertex, and temple smooth, shiny; frons bare, vertex and upper temple nearly so. Labrum exposed. Clypeus weakly to distinctly protruding in profile. Malar sulcus deeply impressed. Mandible gradually to somewhat more abruptly widening from apex to base, carinate ventrally over most of basal half, never with distinct basal tooth as in *Opius* s. str. Maxillary palp longer than head, reaching mid coxa. Occipital carina present laterally, extending dorsal-medially at least to level of inner eye margin, broadly absent mid-dorsally; widely separated from hypostomal carina at base of mandible.

Mesosoma. Pronotum dorsally with narrow, transverse, crenulate sulcus extending continuously along lateral pronotum to ventral corner; weak to deep median pit interrupting sulcus dorsally. Mesoscutum in profile with anterior declivity very slightly concave, nearly vertical; notaulus present on anterior portion of mesoscutal disc, angled laterally at anterior end, laterally-directed portion carinate along anterior margin; notaulus continuous with weakly to distinctly crenulate impression bordering lateral mesoscutal margin, the impression extending posteriorly at least to level of tegula; midpit of mesoscutum well-developed, discrete. Scutellar sulcus (Fig. 31) narrow, though not exceptionally so, 3–4 times wider than mid-length, crenulate, with numerous closely-

spaced ridges. Mesopleuron smooth, shiny, posterior margin not crenulate; precoxal sulcus distinctly impressed, crenulate. Propodeum with large median areola, variously obscured by sculpture.

Wings. Slightly more than twice as long as wide. Stigma long, very narrow, nearly parallel-sided basally, widening distally; thickest part of stigma twice maximum width of proximal half. Radial cross-vein (r) thickened, weakly to strongly bowed anteriorly, arising from extreme base of stigma, nearly in line with 3RSa; RS+M weakly to distinctly sinuate; second submarginal cell nearly parallel-sided, not or only very weakly converging distally; m-cu nearly always postfurcal, entering second submarginal cell; 2CUa distinct, shorter than 2cu-a. Hind wing with both RS and M distinct nearly to wing margin, usually nebulous; very weakly pigmented; m-cu varying from indistinct in smaller individuals to present in larger individuals as a weakly pigmented impression extending more than half way to wing margin.

Legs. Hind femur slender, dorsal surface uneven, somewhat bilobed.

Metasoma. Petiole with distinct dorsope; dorsal and lateral surface densely striate to strigose, largely obscuring dorsal carinae except at base; spiracle of T1 located at or slightly posteriad mid-length; sternite short but distinct, extending 0.4–0.5 distance between base of T1 and spiracle. Metasoma posteriad petiole pyriform, unsculptured, with row of setae evenly spaced on posterior margin of tergites; T2 spiracle laterally displaced. Ovipositor nearly straight, without dorsal node; ovipositor sheath setose throughout.

Hosts. Agromyzidae. See comments under *E. abnormis*, the only species with host records.

Comments. Fischer (1972) provides the most recent detailed description of *Eurytenes* s. str. (in German); Wharton (1988, 2006), Fischer (1998), and Wu and Chen (2006) provide diagnoses for *Eurytenes* s. str. and s. l. Wu and Chen (2006) were the first to use morphological features other than color for discriminating between species of *Eurytenes* s. str.

Key to New World species of *Eurytenes* sensu stricto

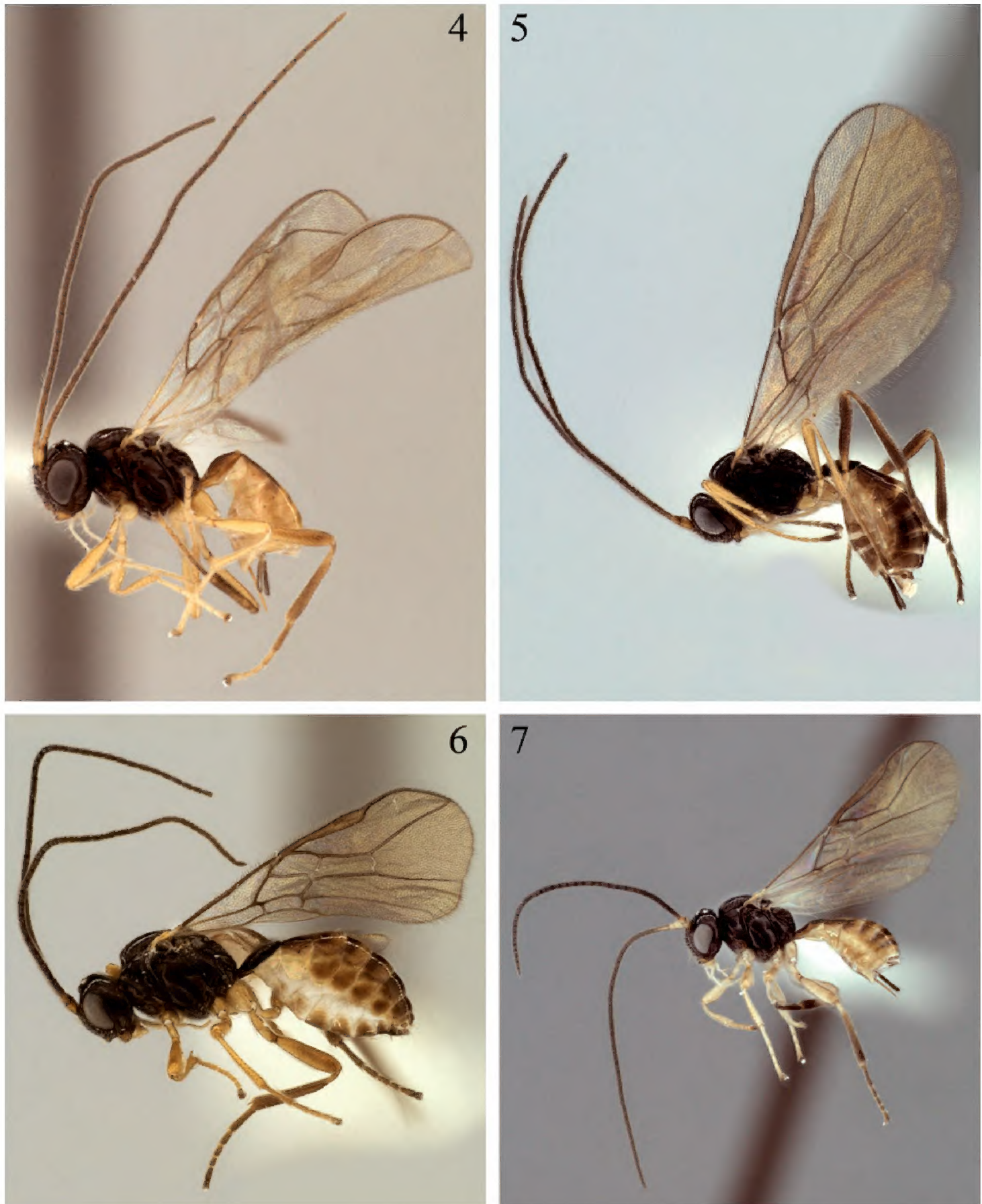
- 1 Hind femur almost entirely dark brown (Fig. 5); petiole entirely dark brown to black, more than twice longer than apical width. Mexico..... *Eurytenes ormenus*
- Hind femur yellow, sometimes slightly infuscated distally; petiole variable.. 2
- 2 Gena broad (Fig. 28); petiole uniformly dark brown to black (Fig. 29). Mexico *Eurytenes pachycephalus*
- Gena narrow (Figs 8, 15, 24); petiole partly (Figs 3, 17) to entirely (Fig. 13) yellow 3
- 3 Petiole yellow (Fig. 13); clypeus somewhat chevron shaped (Fig. 10) *Eurytenes abnormis*
- Petiole mostly dark brown to black dorsally (Fig. 17), yellow laterally (Fig. 3); clypeus truncate or nearly so ventrally, broader and more nearly semi-circular (Figs 1, 18) 4

- 4 Antenna with 31–35 flagellomeres; clypeus obviously infusate dorsally (Fig. 18)..... *Eurytenes dichromus*
 – Antenna with 29–31 flagellomeres; clypeus barely infusate dorsally (Fig. 1) ..
*Eurytenes microsomus*

***Eurytenes abnormis* (Wesmael)**

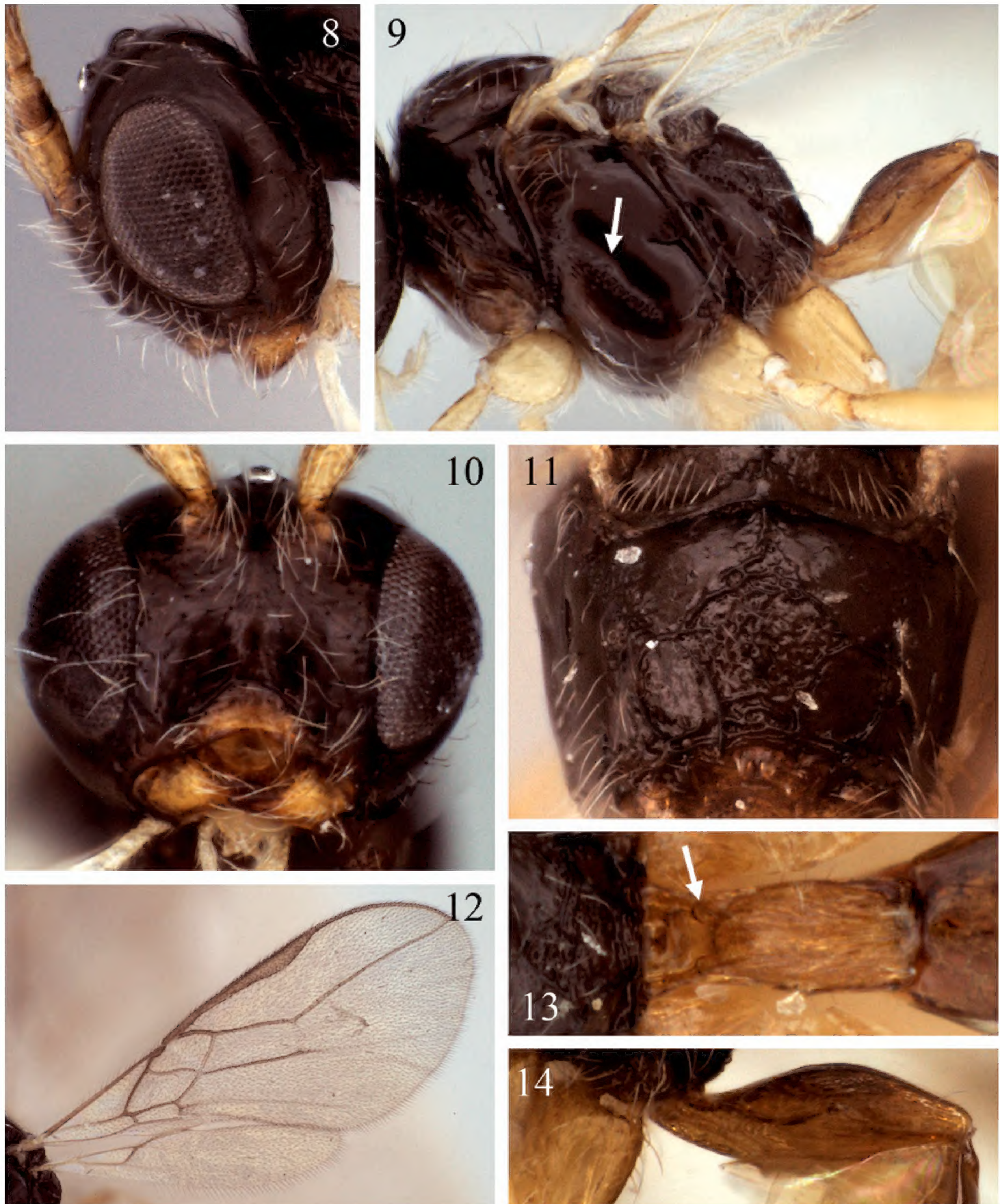
Figs 4, 8–14, 31

Opius abnormis Wesmael 1835: 117. ♀♂ Syntypes in Brussels.*Opius abnormis*: Haliday 1837: 204 (redescription, habitat); Ratzeburg 1848: 62 (diagnosis, hosts).*Eurytenes abnormis*: Foerster 1862: 259 (genus description in key, *abnormis* as type species); Taschenberg 1866: 79, 87 (key, diagnosis); Marshall 1872: 122 (British catalog); Marshall 1891: 16–17 (redescription, English); Marshall 1894: 283–284, 291–292 (key, redescription, French); Dalla Torre 1898: 67 (catalog); Szépligeti 1904: 159, 163 (key, catalog); Niezabitowski 1910: 89 (distribution, brief characterization); Fischer 1959: 248–250 (redescription, hosts); Fulmek 1962: 47–50 (hosts); Fischer 1965: 165–167 (redescription, North American distribution); Fischer 1972: 472–475 (monograph); Marsh 1979: 202 (North American catalog); Papp 1985: 344–345 (color variation, distribution); Tobias and Jakimavicius 1986: 8, 96–98 (redescription in key, distribution); Tobias 1998 (redescription in key, distribution); Yu et al. 2005 (electronic catalog).**Material examined.** ♀♂, BELGIUM: vicinity of Brussels, v.18??, C. Wesmael (syntypes, Brussels). 1 ♀, ENGLAND: Sheffield, 16–17.viii.1991, R. Wharton (TAMU). 1 ♀, HUNGARY: Protected forest, 13.vi.1974, Hámoriné & Marótiné (TAMU). IRELAND: 3 ♀, Co. Sligo, Trawalua, 10.vii.1936 & 2.viii.1938, A.W.Stelfox (USNM); 1 ♀, Co. Wicklow, Manor Kilbride, 19.vii.1950, A.W. Stelfox (USNM).**Diagnosis.** *Eurytenes abnormis* is most readily recognized by the pale coloration of the petiole and metasoma and is further distinguished from the four North American species described below by the narrower, more ventrally concave clypeus (Fig. 10). The petiole is narrower than in *E. dichromus*, sp. n. and *E. microsomus*, sp. n. and is thus more similar in shape to the darker Mexican species described below.**Description** (♀). Length of body: 1.9–2.4 mm (m=2.2), length of fore wing 2.3–3.0 mm (m=2.7).**Head.** 27–31 flagellomeres; first flagellomere length 4.0–5.0 × width (m=4.4), fifteenth flagellomere length 2.0–3.5 × width (m=2.9), fifth from last flagellomere length 2.2–3.0 × width (m=2.7). Face 1.4–1.7 (m=1.5) × wider than high. Clypeus broadly chevron-shaped, with ventral margin concave; 2.0–3.0 (m=2.5) × wider than high; 1.3–1.8 (m=1.5) × wider than distance between clypeus and eye. Mandible distinctly expanded over basal 0.3, with flange-like ventral carina. Gena relatively narrow (Fig. 8). Occipital carina dorsally extending about 0.6–0.7 × distance from eye to nearest lateral ocellus.



Figures 4–7. *Eurytenes* spp., habitus. **4** *E. abnormis*, female **5** *E. ormenus* sp. n., female **6** *E. pachycephalus* sp. n., male **7** *E. dichromus* sp. n., female.

Mesosoma. Posterior-ventral margin of lateral pronotum crenulate for most of length. Precoxal sulcus parallel-sided, narrowly crenulate along most of length, usually weakly impressed anteriorly, often extending very close to anterior margin of mesopleuron; precoxal sulcus inclined at a 35 degree angle. Notaulus distinctly impressed over anterior third of mesoscutal disc, crenulate over anterior 0.2–0.3; with cluster of short setae at



Figures 8–14. *Eurytenes abnormis*. **8** Head, lateral view **9** Mesosoma, lateral view, arrow = precoxal sulcus **10** Face **11** Propodeum, posterior view **12** Left fore and hind wing **13** Petiole, dorsal view, arrow = dorsope **14** Petiole, lateral view.

rugulose base of anterior declivity; with widely spaced line of 3–5 longer setae extending posteriorly towards but not usually reaching cluster of scattered setae around midpit. Propodeum with median carina present anteriorly, bifurcating near middle to form five-sided median areola over posterior 0.6, surface rugose laterally and posterior-medially, partly obscuring areola, but posterior-lateral fields largely smooth, as in Fig. 11.

Wings. Fore wing r-m tubular and pigmented only at extreme anterior end, otherwise unpigmented, with lateral boundaries often only weakly indicated; (RS+M) b absent, m-cu entering extreme base of second submarginal cell; 3M very weakly pigmented basally in available material, spectral over most of length. Hind wing m-cu varying from indistinct in smaller individuals to present as a spectral impression extending more than half way to wing margin in larger individuals.

Legs. Hind tibia 7.5–9.3 ($m=8.7$) \times longer than maximum width.

Metasoma. Petiole 1.9–2.2 ($m=2.0$) \times longer than apical width. Female ovipositor short but distinctly protruding, about 0.9 \times length of mesosoma. Ovipositor sheath about 0.4 \times length of mesosoma.

Color. Head and mesosoma dark reddish-brown to black. Scape, pedicel and first flagellomere yellow, antenna quickly darkening distally to dark brown; palps and tegula pale yellow; mandible and petiole tawny (darker yellow). Metasoma posteriad petiole usually bright yellow, sometimes with faint slight butterscotch banding to lighter brown banding. Hind femur and tibia darkening distally, femur transitioning from yellow to dark yellow or yellow-brown, tibia mostly infuscated, tarsi infuscated; legs otherwise yellow. Ovipositor sheath dark brown to black; ovipositor light brown throughout. Wings hyaline.

Host Records. Fischer (1959) listed 12 species of Agromyzidae, one Anthomyiidae, and one microlepidopteran as hosts but with no records of host plants. In this publication Fischer also noted that the anthomyiid and especially the microlepidopteran host (*Coleophora nigricella* Rondani) need verification. Fischer (1964) added four more dipterans to the list and later (Fischer 1969a, b) provided additional records, including host plant information for nearly all of the known hosts. Nomenclatural updates for agromyzids and plant hosts from Fischer (1972) and Yu et al. (2005) are incorporated in the list of confirmed hosts given below, with additional updates from Ellis (2007). Host plants for these 23 agromyzid hosts are split unevenly between monocots (8 fly species) and dicots (15 fly species). Four of the host fly species were reared from Asteraceae and four from Poaceae, whereas Lamiaceae, Ranunculaceae, and Cyperaceae each harbored three host fly species.

The agromyzid host records found in Fischer (1964, 1969a, b) have a relatively high degree of confidence because these records pertain to rearings by Buhr, Groschke, and Nowakowski, respectively. Fischer identified the *Eurytenes* reared from these hosts (specimens in NHMW) and the hosts and host plants correspond well with information in Ellis (2007). Earlier literature, and several compilations based on the earlier primary sources, are problematic, however, because of the potential for misidentification of the wasp and/or host fly, as well as the absence of voucher specimens. We follow Fischer (1959) and treat the published host records for *Pegomya bicolor* (Wiedemann) (Diptera: Anthomyiidae) and *Amauromyza verbasici* (Bouché) dating to Bouché (1834), Ratzeburg (1848), and Rondani (1872) as almost certainly erroneous and likely based on misidentification of the other opiines that routinely attack these hosts or possibly on misidentification of the host. Records of non-dipteran hosts are clearly erroneous since members of the Opiinae are all parasitoids of cyclorrhaphous Diptera.

Host: Plant. *Agromyza albitarsis* Meigen: host plant for *E. abnormis* has not been recorded previously but since this fly is known to attack several trees in the family Salicaceae, the record may need to be verified;

Agromyza woerzi Groschke: *Knautia arvensis* (L.) Coult, Caprifoliaceae;

Amauromyza labiatarum (Hendel): *Galeopsis tetrahit* L., Lamiaceae;

Amauromyza lamii (Kaltenbach): *Lamium galeobdolon* (L.), Lamiaceae;

Cerodontha angulata (Loew): *Carex hirta* L., Cyperaceae;

Cerodontha caricivora (Groschke): *Carex hirta* L., Cyperaceae;

Cerodontha eucaricis Nowakowski: *Carex hirta* L., Cyperaceae;

Cerodontha flavocingulata (Strobl): *Festuca pratensis* Huds. (= *Lolium pratense*) and *Holcus lanatus* L., Poaceae;

Cerodontha incisa (Meigen): *Alopecurus pratensis* L. and *Phleum pratense* L., Poaceae;

Cerodontha iraeos (Robineau-Desvoidy): *Iris pseudacorus* L., Iridaceae;

Cerodontha pygmaea (Meigen): *Dactylis glomerata* L. and *Deschampsia cespitosa* (L.), Poaceae;

Liriomyza balcanica (Strobl): host plant for *E. abnormis* has not been previously recorded but this fly is known to attack members of the Euphorbiaceae;

Liriomyza demeijerei Hering: *Artemisia vulgaris* (L.), Asteraceae;

Liriomyza eupatoriana Spencer: *Eupatorium cannabinum* L., Asteraceae;

Liriomyza flaveola (Fallén): *Festuca pratensis* Huds., Poaceae;

Liriomyza scorzonerae Rydén: *Scorzonera humilis* L., Asteraceae;

Phytoliriomyza variegata (Meigen): host plant for *E. abnormis* has not been previously recorded but this fly is known to attack members of the Fabaceae;

Phytomyza abdominalis Zetterstedt: *Hepatica nobilis* Mill., Ranunculaceae;

Phytomyza albimargo Hering: host plant for *E. abnormis* has not been recorded previously but this fly is known to attack *Anemone* in the Ranunculaceae;

Phytomyza fallaciosa Brischke: *Ranunculus repens* L., Ranunculaceae;

Phytomyza obscura Hendel: *Clinopodium vulgare* L., Lamiaceae;

Phytomyza pulmonariae Nowakowski: *Pulmonaria angustifolia* L., Boraginaceae;

Phytomyza senecionis Kaltenbach: *Senecio nemorensis fuchsii* (= *Senecio fuchsii* Celak), Asteraceae.

Distribution. Previously recorded from throughout most of Europe (specifically Austria, Belgium, Bulgaria, Croatia, England, Finland, Germany, Hungary, Ireland, Italy, Lithuania, Poland, western Russia as far as the Urals, and Ukraine). Also recorded from eastern Palearctic (Korea and Sakhalin Island), central to eastern Canada (Ontario, Saskatchewan) and USA (Minnesota, Missouri, North Dakota, South Carolina). Specific references to individual records can be found in Yu et al. (2005) for the most part; the record from the Urals is from Tobias and Jakimavicius (1986). Fischer (1970) recorded *E. abnormis* from Montana; however, the specimen on which it is based was collected in Missouri (label information only indicated the state as Mo.). The records from Sakhalin (Tobias 1998) and Korea (Papp 1985) may need to be verified in light of other species described from that general region. The specimens we have examined

from Taiwan and the Kuril Islands differ in wing venation, body coloration, and sculpture from typical *E. abnormis*. Papp (1985) also noted the darker coloration of the petiole of his Korean specimen.

Comments. Fischer (1972) treated *Opius paradoxus* Ratzeburg, 1848 as a nomen nudum, while Dalla Torre (1898) listed it with a query as a synonym under *E. abnormis*, undoubtedly following Marshall (1891). Ratzeburg (1848), in his treatment of *Opius*, separated *abnormis* from all other species on the basis of the wing venation features that we now use to define *Eurytenes* s. str. Ratzeburg (1848) initially states that only a single species, *abnormis*, belongs to the section of *Opius* with the radius arising from the base of the stigma. In the following sentence, however, Ratzeburg introduces the name *paradoxus*, indicating that it also should be placed here. Though this can be interpreted to mean that Ratzeburg was treating *paradoxus* as a synonym of *abnormis*, nevertheless he also mentioned body coloration (dark) and clypeal characters (lack of opening between clypeus and mandibles) that differ from typical *abnormis*. Ratzeburg referred to Bouché throughout when discussing *paradoxus* and *abnormis*, and at the end of his treatment gives information on a more typical pale specimen of *abnormis* reared by Bouché. Whether intentional or otherwise, it would appear that Ratzeburg (1848) did provide a valid description of *paradoxus* with two characters that could be used to differentiate it from *abnormis*. However, his text could just as easily be interpreted to mean that *paradoxus* is invalid since it was first proposed as a synonym of *abnormis*. We prefer the latter interpretation.

Wu and Chen (2006) were the first to use morphological features other than color for discriminating between species of *Eurytenes* s. str. They used propodeal sculpture and the extent of the precoxal sulcus to differentiate their newly described *E. basinervis* from *E. orientalis*. Previously, Fischer (1966, 1998) used only color differences to distinguish between *E. orientalis* and *E. abnormis*. We have noted differences among species in the shape of the clypeus, but the appearance of the ventral margin of the clypeus changes with angle of view, and the differences are subtle. All species appear to have a concave ventral margin if the ventral part of the head is strongly rotated anteriorly. When placed in the same plane of view, however, the clypeus of the New World species described here is more truncate ventrally than that of *E. abnormis*.

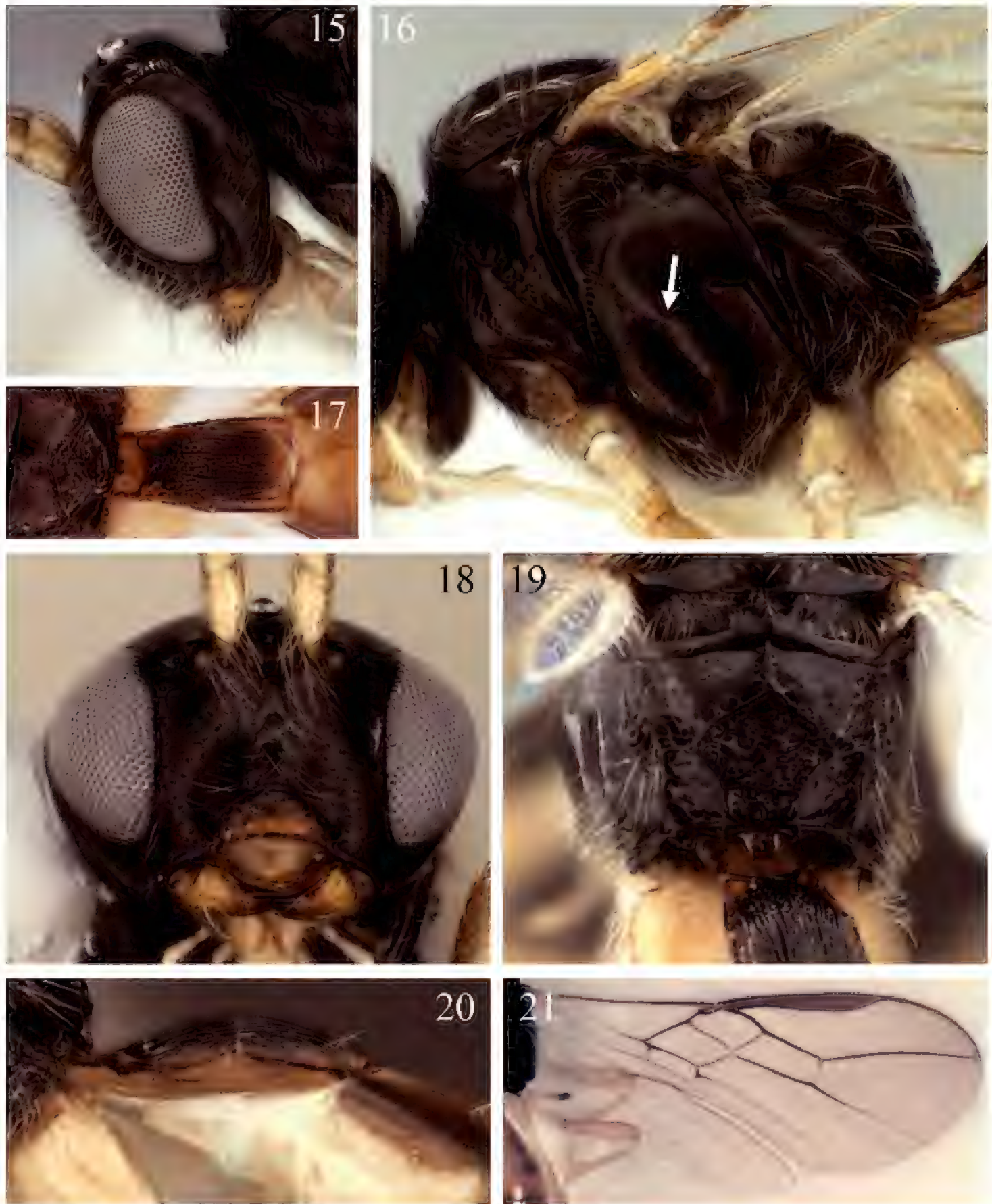
In addition to specimens listed in the material examined section above, two specimens from Poland and one from Germany (NHMW) were also briefly examined; data for these specimens were previously recorded by Fischer (1969a, b). In our summary of references above, we have not included several papers that provide only distribution information. These can be found in Yu et al. (2005).

***Eurytenes dichromus* Walker & Wharton, sp. n.**

[urn:lsid:zoobank.org:act:FF64FD26-929E-4F40-8DD6-2D22519C6005](https://zoobank.org/act:FF64FD26-929E-4F40-8DD6-2D22519C6005)

Figs 2, 7, 15–21, 30, 32, 33

Holotype ♀ (TAMU): [USA:] TEXAS: Brazos Co. College Station Lick Creek Park 28.iv–11.v.2001 R. Wharton [five lines on a single label].



Figures 15–21. *Eurytenes dichromus* sp. n. **15** Head, lateral view **16** Mesosoma, lateral view, arrow = precoxal sulcus **17** Petiole, dorsal view **18** Face **19** Propodeum, posterior view **20** Petiole, lateral view **21** Fore and hind wing.

Paratypes (TAMU, USNM): 5 ♀, same data as holotype; 5 ♀, same data except 11–21.v.2001; 2 ♀, same data except 15–28.iv.2001; 1 ♀, same data except 1–11.vi.2001; 1 ♀, same data except 6–16.iv.2007, M. Cameron & A. Colvin; 1 ♀, same data except 19.iv–12.v.2009, J. B. Woolley; 1 ♀, Texas, Travis Co., Austin, Longhollow, 10–23.iv.1993. R. Wharton; 1 ♀, Texas, Walker Co., Huntsville, 2.iv.2006, R.

Wharton. Additional specimens, not paratypes (TAMU): 2 ♀, Florida, Alachua Co., Hague Dairy, 29 47.311'N, 82 24.880'W, 28.iii.2007, J. Sivinski; 1 ♀, same data except 29 47.328'N, 82 24.969'W, 29.iii.2007; 1 ♀, Texas, Anderson Co., 10 mi SW Elkhart, 5–6.vi.1976, H. R. Burke.

Diagnosis. This species is most readily recognized by its broader, bicolored petiole and bicolored, ventrally truncate clypeus. Based on the shape and color pattern of the petiole, as well as the shape of the clypeus, *E. dichromus* is most similar to *E. microsomus*, sp. n. The propodeum is nearly always more heavily sculptured in *E. dichromus* than in *E. microsomus* and usually slightly more rugulose posterior-laterally than in *E. abnormis*.

Description (♀). Length of body: 2.4–2.7 mm ($m=2.6$), length of fore wing 2.9–3.1 mm ($m=3.0$).

Head. 31–35 flagellomeres; first flagellomere length $2.6\text{--}3.3 \times$ width ($m=3.0$), fifteenth flagellomere length $2.0\text{--}2.3 \times$ width ($m=2.2$), fifth from last flagellomere, length $1.7\text{--}2.4 \times$ width ($m=2.0$). Face $1.6\text{--}1.9$ ($m=1.7$) \times wider than high. Clypeus semi-ellipsoidal in shape, with ventral margin truncate or nearly so, $2.2\text{--}2.8$ ($m=2.4$) \times wider than high; $1.3\text{--}1.7$ ($m=1.45$) \times wider than distance between clypeus and eye. Mandible distinctly expanded over basal 0.3, with flange-like ventral carina. Gena relatively narrow (Fig. 15). Occipital carina extending about $0.3\text{--}0.4 \times$ distance from eye to nearest lateral ocellus.

Mesosoma. Posterior-ventral margin of lateral pronotum crenulate for most of length. Precoxal sulcus narrowly crenulate anteriorly, sculptured area broadening posteriorly, usually weakly impressed anteriorly, often extending very close to anterior margin of mesopleuron; precoxal sulcus approximately 45 degrees, inclined more vertically than in *E. abnormis*. Notaulus distinctly impressed over anterior third of mesoscutal disc, crenulate over anterior 0.2–0.3; with dense cluster of short setae at rugulose base of anterior declivity extending ventrally to cover most of anterior declivity; with widely spaced line of 3–5 longer setae extending posteriorly towards but not usually reaching cluster of scattered setae around midpit as in Fig. 30. Propodeum with median carina present anteriorly, bifurcating near basal 0.3 to form five-sided median areola over posterior 0.6–0.7, surface extensively rugose laterally and posterior-medially (Figs 32, 33), partly obscuring areola, posterior-lateral fields often completely rugose.

Wings. Fore wing r-m pigmented basally, less commonly over anterior 0.5, otherwise unpigmented, largely tubular, with lateral boundaries usually distinct for most of length; m-cu usually postfurcal, entering base of second submarginal cell, less commonly interstitial; 3M distinctly pigmented, nearly tubular in basal third, gradually weakening and becoming depigmented distally. Hind wing m-cu usually poorly developed, varying from very weakly to distinctly impressed.

Legs. Hind tibia $7.5\text{--}9.1$ ($m=8.25$) \times longer than maximum width.

Metasoma. Petiole $1.45\text{--}1.8$ ($m=1.6$) \times longer than apical width. Female ovipositor short, but distinctly protruding, about $0.8 \times$ length of mesosoma. Ovipositor sheath about $0.4 \times$ length of mesosoma.

Color. Head and mesosoma black, with small red-brown spot adjacent eye dorsal-medially near ocelli, face at base of antennae also usually red-brown. Scape and pedicel

yellow, flagellomeres dark brown; mandible butterscotch with distal tip infuscated; clypeus infuscated, dark brown dorsally, butterscotch ventrally; palps and tegula yellow. Petiole dark brown dorsally, posterior fifth and ventral-lateral region usually yellow. T2+3 butterscotch medially; T2 and T3 each with a medium brown lateral splotch; T4 and successive tergites each with dark brown transverse banding anteriorly fading to butterscotch posteriorly. Hind tibia pale yellow to whitish over about basal 0.15, remainder infuscated to medium brown, tarsus completely medium brown, legs otherwise yellow to nearly white, with femur and trochantellus often (though not in holotype) darker yellow than coxa and trochanter. Ovipositor sheath dark brown; ovipositor light brown. Wings hyaline.

Male and Host. Unknown.

Distribution. Known only from central Texas.

Etymology. The name *dichromus* is derived from Greek: *di*, two; *chromus*, color. The name refers to the color of the clypeus.

Comments. Fischer (1965) noted a considerable range in body size for *E. abnormis*. Body size is affected by host size (e. g. Wharton 1983), and the consistent difference in body size between *E. dichromus* and *E. microsomus*, sp. n. suggests different patterns of host utilization for these two nearly identical species. The non-paratypes are all relatively poorly preserved, obscuring the true color pattern, but indicate a fairly broad geographical range for this species. This species is thus far known only from females.

***Eurytenes microsomus* Walker & Wharton, sp. n.**

urn:lsid:zoobank.org:act:7964BF18-1081-49C5-941B-699F6CBDE324

Figs 1, 3, 34, 35

Holotype ♀ (TAMU): [USA:] TX: San Patricio Co. Welder Wildlife Refuge March 23, 1996 R. Wharton [five lines on a single label].

Paratypes (TAMU): 3 ♀, 3 ♂, same data as holotype; 1 ♂, Texas, Travis Co., Austin, 20.ix.1986, R. Wharton; 1 ♀, same data except 29.iv.1989; 1 ♀, Travis Co., vic. Long Hollow Ck. 30°27'43", 97°52'19", 26.iii.1994, on *Quercus buckleyi*, M. Quinn, E. Riley, R. Wharton.

Diagnosis. This species is nearly identical to *E. dichromus* but *E. dichromus* is 1.25 × larger. The body is less heavily sculptured than in *E. dichromus*, there are fewer flagellomeres, and T2+3 tends to be paler in coloration.

Description (♀). Length of body: 2.00–2.12 mm (m=2.08), length of fore wing 2.4–2.7 mm (m=2.5).

Head. 29–31 flagellomeres; first flagellomere length 2.3–3.6 × width (m=2.8), fifteenth flagellomere length 2.0–3.0 × width (m=2.3), fifth from last flagellomere length 2.0–2.8 × width (m=2.3). Face 1.4–1.7 (m=1.6) × wider than high. Clypeus more nearly semi-circular in shape, with ventral margin truncate, 2.0–2.5 (m=2.2) × wider than high; 1.5–1.9 (m=1.7) × wider than distance between clypeus and eye. Mandible

distinctly expanded over basal 0.3, with flange-like ventral carina. Gena relatively narrow (Fig. 3). Occipital carina extending about $0.3\text{--}0.4 \times$ distance from eye to nearest lateral ocellus.

Mesosoma. Posterior-ventral margin of lateral pronotum weakly crenulate, nearly smooth for most of length. Precoxal sulcus parallel-sided, narrowly crenulate, short, weakly impressed anteriorly, not extending close to anterior margin of mesopleuron; precoxal sulcus at 45 degree angle, inclined more vertically than in *E. abnormis*. Notaulus distinctly impressed over anterior third of mesoscutal disc, crenulate over anterior 0.2–0.3; with moderately dense cluster of short setae at rugulose base of anterior declivity extending ventrally to cover much of anterior declivity; with widely spaced line of 3–4 longer setae extending posteriorly towards but not reaching cluster of scattered setae around midpit (Fig. 3). Propodeum with median carina extending over anterior 0.3 before bifurcating to form five-sided areola over posterior 0.7. Surface smooth to weakly rugose laterally and posteriorly, carinae forming areola not obscured by sculpture, entirely visible, areola varying from smooth to weakly rugose (Figs 34, 35).

Wings. Fore wing r-m at most pigmented at extreme base, largely tubular (with lateral boundaries distinct) over anterior half; m-cu distinctly postfurcal; 3M distinctly pigmented in basal third, gradually weakening and becoming depigmented distally. Hind wing m-cu indistinct.

Legs. Hind tibia $7.5\text{--}8.7$ ($m=8.1$) \times longer than maximum width.

Metasoma. Petiole $1.6\text{--}1.8$ ($m=1.7$) \times longer than apical width. Female ovipositor short but distinctly protruding, about $0.9 \times$ length of mesosoma. Ovipositor about $0.5 \times$ length of mesosoma.

Color. Head and mesosoma dark reddish-brown as in *E. abnormis*, but with pale spot adjacent eye similar to though weaker than the spot in *E. dichromus*. Scape and pedicel butterscotch, flagellomeres medium brown; clypeus butterscotch with slight infuscation dorsally. Palps, mandible, tegula, petiole, and ovipositor as in *E. dichromus*. Metasoma posteriad petiole patterned as in *E. dichromus* but T2+3 paler, whitish medially and T2 more lightly infuscate laterally. Legs about as in *E. dichromus*, with hind legs often a little paler. Ovipositor sheath dark red-brown. Wings hyaline.

Male. Same as female except length of body $1.97\text{--}2.05$ mm ($m=2.01$), length of fore wing $2.0\text{--}2.4$ mm ($m=2.3$). Antenna with 24–28 flagellomeres; first flagellomere length $3.0\text{--}3.5 \times$ width ($m=3.4$), fifteenth flagellomere length $2.4\text{--}3.0 \times$ width ($m=2.6$), fifth from last flagellomere length $2.0\text{--}2.5 \times$ width ($m=2.4$). Clypeus $1.3\text{--}2.3$ ($m=1.8$) \times wider than distance between clypeus and eye. Hind tibia $7.5\text{--}8.3$ ($m=7.9$) \times longer than maximum width. Petiole $2.0 \times$ longer than apical width. Metasoma butterscotch dorsally with medium brown lateral banding on T2 and T3.

Host. Unknown.

Distribution. Central Texas.

Etymology. The name *microsomus* is derived from Greek: *micro*, small; *somus*, body. The name refers to the smaller size of this species compared to other species of *Eurytenes*.

Comments. *Eurytenes microsomus* and *E. dichromus* both occur in Austin, the westernmost locality for either species.

***Eurytenes ormenus* Walker & Wharton, sp. n.**

urn:lsid:zoobank.org:act:1CFFE835-69F9-49B3-8CE8-2FBDD05D5918

Fig. 5, 22–25

Holotype ♀ (TAMU): MEXICO: Guerrero 6.4 mi SW Filo de Caballo 9000 ft VII-8-1987 R. Wharton [five lines on a single label].

Paratypes (TAMU): 1 ♀, same data as holotype except collected by Woolley and Zolnerowich; 1 ♀, Guerrero, 7 mi SW Filo de Caballo, 12.vii.1985, J. Woolley and G. Zolnerowich.

Diagnosis. This species is most readily recognized by the dark brown hind femur. All other species from the New World have relatively pale (whitish to dark yellow) hind femora. The petiole is completely dark, as in *E. pachycephalus*, sp. n., but the latter is a much larger species with a distinctly broader gena.

Description (♀). Length of body: 1.9–2.2 mm (m=2.0), length of fore wing 2.8–3.2 mm (m=2.8).

Head. 27–29 flagellomeres; first flagellomere length $3.0\text{--}5.5 \times$ width (m=4.3), fifteenth flagellomere length $3.5\text{--}4.0 \times$ width (m=3.7), fifth from last flagellomere $3.5 \times$ width. Face $1.4\text{--}1.6$ (m=1.5) \times wider than high. Clypeus nearly semi-circular in shape, with ventral margin truncate to very slightly concave (Fig. 22); $1.7\text{--}2.1$ (m=1.95) \times wider than high; $1.2\text{--}1.5$ (m=1.35) \times wider than distance between clypeus and eye. Mandible not obviously expanded basally. Gena relatively narrow (Fig. 24). Occipital carina extending about $0.7\text{--}0.8 \times$ distance from eye to nearest lateral ocellus.

Mesosoma. Posterior-ventral margin of lateral pronotum distinctly impressed, varying from crenulate to nearly smooth for most of length. Precoxal sulcus weakly impressed, not extending close to anterior margin of mesopleuron; precoxal sulcus approximately 30 degrees, inclined slightly less vertically than *E. abnormis*. Notaulus narrow, weakly impressed, crenulate over anterior 0.3 of mesoscutal disc; with relatively sparse cluster of short setae at finely rugulose base of anterior declivity and 1–2 widely spaced longer setae extending posteriorly. Propodeum with median carina present anteriorly, bifurcating near anterior 0.2 to form five-sided areola over posterior 0.8; surface densely punctate-rugose to coarsely granular laterally and posteriorly, obscuring carinae, weakly sculptured to nearly smooth anteriorly on either side of short median carina.

Wings. Fore wing r-m very weakly pigmented at extreme base; somewhat tubular (with lateral boundaries distinct) over anterior 0.3–0.5; m-cu distinctly postfurcal; 3M distinctly pigmented in basal third, gradually weakening and becoming depigmented distally. Hind wing m-cu indistinct.

Legs. Hind tibia $8.7\text{--}9.5$ (m=9.1) \times longer than maximum width.



Figures 22–25. *Eurytenes ormenus* sp. n. **22** Face **23** Mesosoma, lateral view, arrow = precoxal sulcus **24** Head, lateral view **25** Propodeum, dorsal view, arrow = sculptured posterior-lateral field.

Metasoma. Petiole 2.3–2.9 ($M=2.65$) \times longer than apical width. Female ovipositor short but distinctly protruding, about 0.9 \times length of mesosoma. Ovipositor sheath about 0.5 \times length of mesosoma.

Color. Head, thorax, and petiole dark red-brown. Scape and pedicel yellow, first four flagellomeres light brown, quickly darkening distally to dark brown; palps, mandible, clypeus, and tegula yellow. Metasoma posteriad petiole medium brown. Legs yellow except hind femur medium to dark brown medially with apical and basal 0.1–0.15 pale, tibia and tarsus almost completely medium brown, tibia variously pale brown dorsally. Ovipositor sheath dark brown, ovipositor light brown. Wings hyaline.

Male and Host. Unknown.

Distribution. South central Mexico.

Etymology. The name *ormenus* is derived from Greek: *ormenus*, petiolated. The name refers to the elongate petiole of the species.

Comments. This is a small-bodied species similar in size to *E. microsomus* but with a more heavily sculptured propodeum and darker hind femur. *Eurytenes ormenus* is characterized by the long, narrow petiole, similar in form to the petiole of *E. pachycephalus* sp. n. and *E. abnormis* and unlike the broader petiole of *E. microsomus* and *E. dichromus*. As in *E. pachycephalus* sp. n., and unlike the other three species, the petiole is uniformly very dark in coloration. The anterior tentorial pits of *E. ormenus* are slightly larger in this species than in the others treated here.

***Eurytenes pachycephalus* Walker & Wharton, sp. n.**

urn:lsid:zoobank.org:act:422562A0-496F-44C1-B403-B206893B2DB3

Fig. 6, 26–29

Holotype ♀ (TAMU): Mexico: Michoacan 6 mi. N. Cheran 8-VII-1985 Woolley & Zolnerowich [four lines on a single label].

Paratypes (TAMU): 10 ♂, same data as holotype except eight with date 7–8. vii.1985.

Diagnosis. This species is most readily recognized by its broad clypeus and inflated gena. It is a much larger species than *E. ormenus*, which was also collected at high elevation sites in central Mexico. Although both *E. pachycephalus* and *E. ormenus* have a uniformly dark petiole, the hind femur is dark in *E. ormenus* and more lightly colored in *E. pachycephalus*.

Description (♀). Length of body: 2.9 mm, length of fore wing 3.3 mm.

Head. 36 flagellomeres; first, fifteenth, and fifth from last flagellomere length 3.3, 2.3, 2.3 × width, respectively. Face 2.0 × wider than high. Clypeus broad, semi-elliptical, with ventral margin truncate, 2.9 × wider than high; 2.1 × wider than distance between clypeus and eye. Mandible gradually expanded basally, without distinct basal tooth or swelling. Gena broad (Fig. 28). Occipital carina extending about 0.5 × distance from eye to nearest lateral ocellus.

Mesosoma. Posterior-ventral margin of lateral pronotum strigose for most of length, the sculpture extending towards middle of sclerite. Precoxal sulcus extending very close to anterior margin of mesopleuron; deeply crenulate anteriorly, sculptured area broadening posteriorly; precoxal sulcus approximately 45 degrees, inclined slightly more vertically than *E. abnormis*. Notaulus distinctly impressed and crenulate over anterior 0.3–0.4 of mesoscutal disc; with cluster of short setae at rugulose base of anterior declivity extending ventrally to some extent onto anterior declivity at each side; longer setae absent posteriorly. Median carina extending over anterior 0.2 before bifurcating to form five-sided areola; surface of areola and lateral margin of propodeum rugose, posterior-lateral fields and region anteriorad areola smooth or nearly so.

Wings. Fore wing r-m very weakly pigmented at extreme base, largely spectral (with lateral boundaries indistinct); m-cu distinctly postfurcal; 3M distinctly pigmented and largely tubular in basal third, gradually weakening distally. Hind wing m-cu extending nearly half way to wing margin as a very weakly pigmented and impressed curved line.



Figures 26–29. *Eurytenes pachycephalus* sp. n. **26** Face **27** Mesosoma, lateral view, arrow = precoxal sulcus **28** Head, lateral view **29** Petiole, dorsal view.

Legs. Hind tibia $8.3 \times$ longer than maximum width.

Metasoma. Petiole $2.1 \times$ longer than apical width. Female ovipositor sheath barely visible due to postmortem changes in position; visible portion densely setose.

Color. Head, mesosoma, and petiole black. Scape and pedicel yellow, flagellomeres dark brown; mandible butterscotch with distal tip infuscated; clypeus dark brown dorsally, ventral half butterscotch; palps and tegula butterscotch. Metasoma with T2 and T3 brown, middle tergites with brown and yellow transverse banding, apical tergites yellow. Legs yellow except hind tibia butterscotch to weakly infuscate, tarsus entirely medium brown. Wings largely hyaline, though appearing very slightly darker than other species treated here.

Male. Same as female except length of body 2.9–3.1 mm ($m=3.0$), length of fore wing 3.1–3.7 ($m=3.4$). Antenna with 34–38 flagellomeres; first flagellomere length



Figures 30–31. 30 *Eurytenes dichromus* sp. n., mesoscutum, dorsal-lateral oblique, arrow = notaulus
31 *E. abnormis*, mesosoma, dorsal view, arrow = scutellar sulcus.



Figures 32–35. Propodeal sculpture patterns. 32–33 *Eurytenes dichromus* sp. n. 34–35 *E. microsoma* sp. n.

2.3–3.0 × width (m=2.8), fifteenth flagellomere length 2.0–2.35 × width (m=2.25), fifth from last flagellomere length 1.8–2.2 × width (m=2.1). Face 1.9–2.1 (m=2) × wider than high. Clypeus 1.7–3.0 (m=2.3) × wider than distance between clypeus and eye. Precoxal sulcus shape variable, generally narrowing anteriorly and widening ventral-posteriorly. 1–3 longer, somewhat decumbent setae extending posteriorly from notaulus on mesoscutal disc. Fore wing r-m mostly unpigmented, usually tubular throughout (with lateral boundaries distinct). Hind wing m-cu usually extending more than half way to wing margin as a weakly pigmented, spectral impression. Hind tibia 7.4–8.5 (m=7.9) × longer than maximum width. Petiole 2.1–2.7 (m=2.35) × longer than apical width.

Head and petiole dark reddish-brown to black; hind tibia usually more distinctly brown; tergites butterscotch with transverse bands of medium brown on T2–T4 and uniformly medium brown on T5 and following.

Etymology. The name *pachycephalus* is derived from Greek: *pachy*, fat; *cephalus*, head. The name refers to the larger size of the head, extended gena and broad clypeus of this species.

Host. Unknown.

Distribution. Central Mexico.

Comments. We have selected the lone female as the holotype, for ease in comparison with the other species described here, even though the female specimen is not in the best of condition. The hind legs of this species are shorter and broader than those of *E. ormenus*.

Acknowledgements

We are most grateful to the following curators or collection managers and institutions for providing access to material used in this study: David Wahl (AEI), Paul Dessart (deceased, Institut Royal des Sciences Naturelles de Belgique), Bill Mason (deceased, Canadian National Collection), Jeno Papp (Natural Museum of Natural History, Budapest), Max Fischer and Herbert Zettel (NHMW), Paul Marsh and Bob Kula (USNM), and John Sivinski (USDA/ARS, Gainesville, Florida). We also thank Matt Yoder (NC State University) for his support with mx and two anonymous reviewers for useful suggestions. This work was funded by the National Science Foundation Partnerships for the Enhancement and Education in Taxonomy (NSF-PEET) Grant DEB 0328922 and associated REU supplement 1026618.

References

- Achterberg C van (2004) New Indo-Australian sub-genera and species of the genera *Xynobius* Foerster and *Ademoneuron* Fischer (Hymenoptera: Braconidae: Opiinae). *Zoologische Mededelingen Leiden* 78: 313–329.

- Bouché PF (1834) *Naturgeschichte der Insecten besonders in Hinsicht ihrer ersten Zustände als Larven und Puppen*. Nicolaische Buchhandlung, Berlin, 216 pp.
- Chen J, Weng R (2005) *Systematic studies on Opiinae of China (Hymenoptera: Braconidae)*. Fujian Science and Technology Publishing House, Fujian, 269 pp.
- Dalla Torre CG (1898) *Catalogus Hymenopterorum, IV. Braconidae*. G. Engelmann, Leipzig, 323 pp.
- Ellis WN (2007) *Bladmineerders van Europa / Leafminers of Europe*. <http://www.bladmineerders.nl/index.htm>. Zoölogisch Museum Amsterdam. [accessed 13 August 2010]
- Fischer M (1959) Die europaeischen Opiinae (Hymenoptera, Braconidae). *Acta Entomologica Musei Nationalis Pragae* 33: 248–250.
- Fischer M (1964) Die gezüchteten Opiinae der Sammlung Groschke (Hymenoptera, Braconidae). *Stuttgarter Beiträge zur Naturkunde* 136: 1–12.
- Fischer M (1965) Die Opiinae der nearktischen Region (Hymenoptera, Braconidae). II. Teil. *Polskie Pismo Entomologiczne* 35: 3–212.
- Fischer M (1966) Revision der indo-australischen Opiinae. Dr. W. Junk, The Haag, 165 pp.
- Fischer M (1969a) Die von Dr. H. Buhr gezüchteten Opiinae (Hymenoptera, Braconidae). *Zeitschrift für angewandte Zoologie* 56: 65–88.
- Fischer M (1969b) Ueber die von Dr. J. T. Nowakowski aus Agromyzidae und Ephydridae gezüchteten Opiinae (Hymenoptera, Braconidae). *Polskie Pismo Entomologiczne* 39: 369–380.
- Fischer M (1970) Die nearktischen Opiinae der Sammlung der Cornell University, Department of Entomology and Limnology, in Ithaca, New York (Hymenoptera, Braconidae). *Anzeiger der mathematisch-naturwissenschaftliche Klasse der Österreichischen Akademie der Wissenschaften* 1970: 12–32.
- Fischer M (1972) Hymenoptera: Braconidae (Opiinae I). *Das Tierreich* 91: 1–620.
- Fischer M (1977) Hymenoptera: Braconidae (Opiinae II-Amerika). *Das Tierreich* 96: 1–1001.
- Fischer M (1984) Aufteilung des Formenkreises um das Subgenus *Cryptonastes* Foerster des Genus *Opius* Wesmael sowie Ergänzungen zum Subgenus *Tolbia* Cameron. *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 36: 33–40.
- Fischer M (1986) Neue Bestimmungsschlüssel für paläarktische Opiinae, neue Subgenera, Redeskriptionen und eine neue Art (Hymenoptera, Braconidae). *Annalen des Naturhistorischen Museums in Wien* 88/89: 607–662.
- Fischer M (1998) Neue taxonomische Untersuchungen über Madenwespen der Alten Welt mit besonderer Berücksichtigung der Gattungen *Eurytenes* Foerster, *Aulonotus* Ashmead, *Biosteres* Foerster und der Untergattung *Gastrosema* Fischer (Hymenoptera, Braconidae: Opiinae). *Linzer biologische Beiträge* 30: 21–51.
- Foerster A (1862) Synopsis der Familien und Gattungen der Braconen. *Verhandlungen des naturhistorischen Vereines der preussischen Rheinlande und Westphalens* 19: 225–288.
- Fulmek L (1962) *Parasitinsekten der Blattminierer Europas*. Dr. W. Junk, The Haag, 203 pp.
- Gahan AB (1915) A revision of the North American ichneumon-flies of the subfamily Opiinae. *Proceedings of the United States National Museum* 49: 63–95.
- Haliday AH (1837) Essay on parasitic Hymenoptera. *Entomologist's Monthly Magazine* 4: 203–221.

- Marsh PM (1979) Family Braconidae. In: Krombein KV, Hurd PD, Smith DR, Burks BD (Eds) Catalog of Hymenoptera in America North of Mexico Volume 1. Smithsonian Institution Press, Washington, D.C., 144–295.
- Marshall TA (1872) A catalogue of British Hymenoptera: Chrysididae, Ichneumonidae, Braconidae and Evaniidae. A. Napier, Entomological Society of London, London, 135 pp.
- Marshall TA (1891) A monograph of British Braconidae. Part IV. Transactions of the Entomological Society of London 11: 7–61.
- Marshall TA (1894) Les braconides (suite), 10^e Tribu. Opiidae. In: André E (Ed.) Spécies des Hyménoptères d'Europe et d'Algérie. Bouffaut Frères, Gray, 280–359.
- Niezabitowski EL (1910) Materyaly do fauny Brakonidow Polski. Braconidae, zebrane w Galicyi. Sprawozdania Akademii Umiejetnosci w Krakowie 44: 47–106.
- Papp J (1985) Braconidae (Hymenoptera) from Korea, VII. Acta Zoologica Academiae Scientiarum Hungaricae 31: 341–365.
- Quicke DLJ, Achterberg C van, Godfray HCJ (1997) Comparative morphology of the venom gland and reservoir in opiine and alysiine braconid wasps (Insecta, Hymenoptera, Braconidae). Zoologica Scripta 26: 23–50.
- Ratzeburg JTC (1848) Die Ichneumonen der Forstinsecten in forstlicher und entomologischer Beziehung. Zweiter Band. Nicolaischen Buchhandlung, Berlin, 238 pp.
- Rondani C (1872) Degli insetti parassiti e delle loro vittime. Bollettino della Societa Entomologica Italiana 4: 41–78.
- Sharkey MJ, Wharton R (1997) Morphology and Terminology. In: Wharton RA, Marsh PM, Sharkey MJ (Eds) Manual of the New World genera of the Family Braconidae (Hymenoptera). Special publication of the International Society of Hymenopterists No. 1. International Society of Hymenopterists, Washington, DC, 19–37.
- Szépligeti GV (1904) Hymenoptera. Fam. Braconidae. Genera Insectorum 22: 1–253.
- Taschenberg EL (1866) Die Hymenopteren Deutschlands nach ihren Gattungen und theilweise nach ihren Arten als Wegweiser fuer angehende Hymenopterologen und gleichzeitig als Verzeichniss der Halle'schen Hymenopterenfauna. Eduard Kummer, Leipzig, 275 pp.
- Thomson CG (1895) LII. Bidrag till Braconidernas kannedom. Opuscula Entomologica 20: 2141–2339.
- Tobias VI (1998) Subfamily Opiinae. In: Ler PA (Ed) Key to the insects of Russian Far East. Dal'nauka, Vladivostok [In Russian], 558–656.
- Tobias VI, Jakimavicius A (1986) Subfamily Opiinae. In: Tobias VI (Ed) Identification of Insects of European USSR. Volume III, Part V. Academia Nauk, Leningrad, 7–100. [in Russian]
- Wesmael C (1835) Monographie des Braconides de Belgique. Nouveaux Mémoires de l'Academie Royale des Sciences et Belles-Lettres de Bruxelles 9: 1–252.
- Wharton RA (1983) Variation in *Opius hirtus* Fischer and discussion of *Desmiostoma* Foerster (Hymenoptera: Braconidae). Proceedings of the Entomological Society of Washington 85: 327–330.
- Wharton RA (1988) Classification of the braconid subfamily Opiinae (Hymenoptera). The Canadian Entomologist 120: 333–360.

- Wharton RA (2006) The species of *Sternaulopius* Fischer (Hymenoptera: Braconidae, Opiinae) and the braconid sternaulus. *Journal of Hymenoptera Research* 15: 317–347.
- Wu Q, Chen X (2006) Four new species of the genus *Eurytenes* Foerster (Hymenoptera: Braconidae: Opiinae) from China. *Entomologica Fennica* 16: 225–232.
- Yoder M, Dole K, Deans A (2006) Introducing ‘mx’, a sharable digital workbench for systematic biologists. *Proceedings of Taxonomic Database Working Group*. <http://www.tdwg.org/proceedings/article/view/38/0> [accessed 1 Sept 2009].
- Yu DS, Achterberg C van, Horstmann K (2005) *World Ichneumonoidea*. CD Rom Taxapad.